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BRITISH 24.888 OF Oct 29. 1909

A.D. 1909. Oct. 29. No. 24,888.

LISTER'S Complete Specification.

(1 SHEET)

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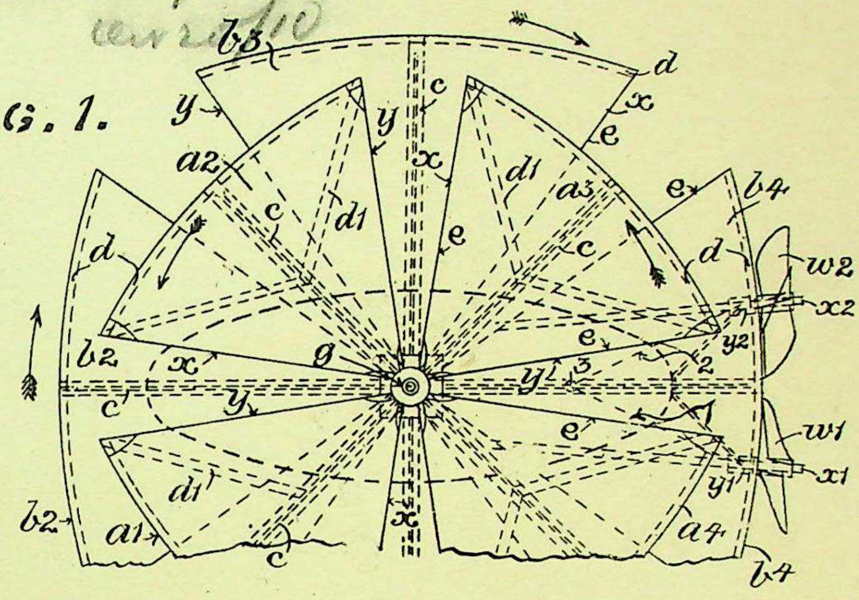
FIG. 1.



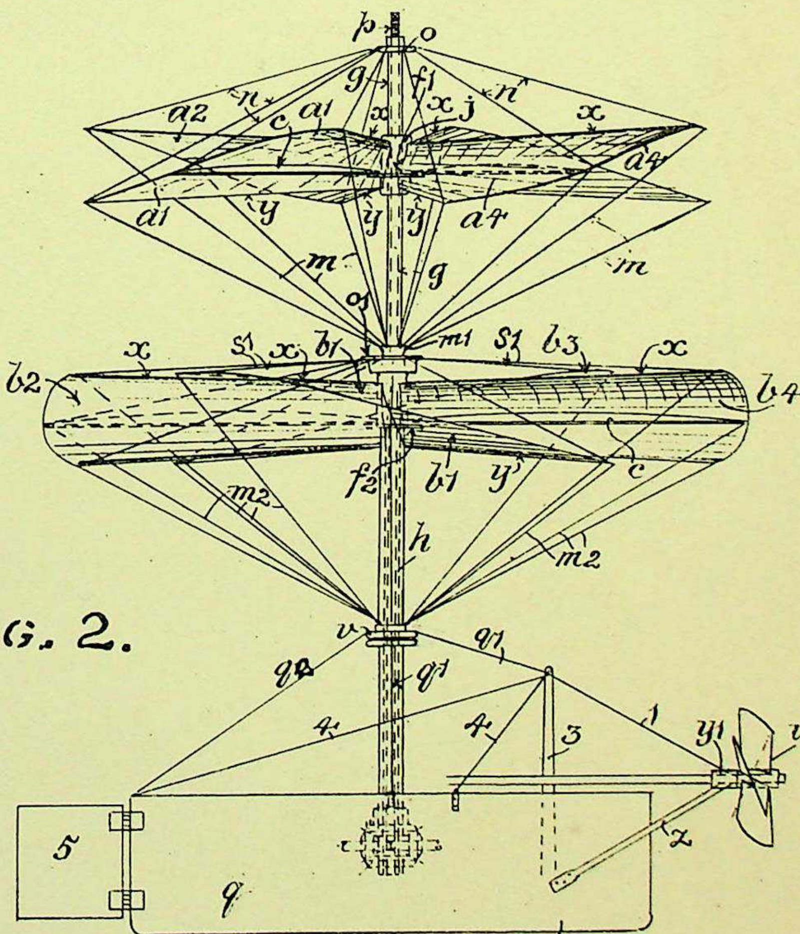


FIG. 2.

[This Drawing is a reproduction of the Original on a reduced scale.]

Malby & Sons Photo-Litho.

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N° 24,888 A.D. 1909

Date of Application, 29th Oct., 1909

Complete Specification Left, 27th Apr., 1910—Accepted, 20th Oct., 1910

PROVISIONAL SPECIFICATION.

Improvements in Aerial Machines.

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I, Ernest Lister, of 3, Box Lane, Pontefract, in the County of York, Labourer, do hereby declare the nature of this invention to be as follows:—

This invention relates to that type of aerial machine in which a pair of fans on the same axial line, but rotating in opposite directions are employed for supporting and lifting the car.

According to this invention, each fan is formed of four vanes or wings, triangular or approximately triangular in shape, with the apex of the triangle directed towards the centre of rotation, the width or base length of each wing being such as to leave a relatively large triangular gap between adjoining edges of adjoining wings, so that as seen in plan, the fan has the shape or approximate shape of a "Maltese" cross. The forward edge of each wing, so considered with reference to the direction of rotation, inclines slightly upwards, and the rear edge slightly downwards, from the centre of the fan. The frame work of each wing is T shaped, consisting of a radial arm, and a cross piece at right angles to the same at the outer end of the radial arm. The cross piece may be slightly curved. The outer ends of the cross pieces are connected by wire or cord to the centre plate or hub of the fan, which also carries the inner end of the radial arms. The outer ends of the cross pieces are also connected by cord or wire to a ring, hereinafter termed the stay ring, attached to the corresponding vertical shaft, at some distance below the fan, so as to include an angle of 50 to 60 degrees with the vertical shaft or thereabouts. These wires take the main lifting strain produced by the wind pressure on the underside of the fan.

The car is diamond or boat shaped in plan, and has a flat bottom.

At the forward end of the car two propellor shafts are mounted side by side, each having a propellor fan or fans at its forward end; which project well beyond the front end of the car. The propellor shafts are most conveniently situated level with the upper edge of the car, and are supported beyond the front end of the car by means of strut pieces, secured to the sides of the car near its forward end. The upper and forward ends of the strut pieces carry the bearings for the propellor shaft, and are connected also by cords or wire to the upper end of a king post fixed to the car, and also to the suspension cord or wire passing from the front end of the car to the suspension plate. The top of the king post is connected also by wire or cord connection to the rear end of the car.

The rotation of the propellor fans is preferably in opposite directions.

Suspension wires or cords also pass from the middle of the sides of the car and from the rear end of the car to the suspension plate.

A rudder plane is hinged to the rear end of the car.

Dated this 28th day of October, 1909.

J. CLARK JEFFERSON, F.I.P.A.,
30, Park Row, Leeds,
Agent for Applicant.

[*Price* 8*d*.]

COMPLETE SPECIFICATION.

Improvements in Aerial Machines.

I, Ernest Lister, of 3, Box Lane, Pontefract, in the County of York, Labourer, do hereby declare the nature of this invention and in what manner the same is to be performed, to be particularly described and ascertained in and by the following statement:—

This invention relates to that type of aerial machine, in which a pair of fans on the same axial line, but rotating in opposite directions, are employed for supporting and lifting the car; the vanes of the fans being approximately triangular in shape, and having the forward edge inclined slightly upward and the rear edge slightly downward. The upper fan is attached to a shaft passing downwards through a hollow shaft carrying the lower fan, and both are usually geared together by differential gear driven from the motor.

This invention refers more particularly to the construction of the vanes of the fans and their connection to the shafts carrying them, and also to the means for carrying the traction fans or propellors.

According to this invention, each fan consists of four triangular vanes connected at their inner ends to a common centre piece attached to the revolving shaft, the angular width of the vanes being about 70 degrees, so that the fan, when looked at in plan, has the shape of a "Maltese" cross, with the gap between adjoining vanes about one fourth the width of a vane.

The frame of each vane consists of a radial piece, tee shaped in cross section, and curved on the upper side, a flat curved or circumferential piece attached at its middle to the outer end of the radial piece, and two flat pieces connecting the ends of the circumferential piece to the middle of the radial arm. The circumferential flat piece forms part of an irregular screw line, the pitch angle at the forward end being much less than towards the rear. The ends of the circumferential pieces are attached by wires or cords to the common centre piece, to form the support for the front and rear edges of the canvas or other cover forming the wing surface. These ends and also the centre of the circumferential piece are also attached by wires and cords to the shaft carrying the fan, at some distance below the fan; preferably at the full distance allowed by the lower fan or the car attachment as the case may be, so as to include an angle of 50 to 60 degrees with the shaft. These wires take the main lifting strain produced by the reaction of the air on the underside of the revolving fan.

Similar wires pass from the same parts to a point in the shaft above the fan, but at a much greater angle to the vertical shaft, for the purpose of steadying the vanes against any wind pressure on the upper side of the fan.

The car is diamond or boat shaped in plan and has a flat bottom.

At the forward end of the car two propellor shafts are mounted side by side, each having a propellor or tractive fan or fans at its forward end, which projects well beyond the front end of the car. The propellor shafts are most conveniently situated level with the upper edge of the car, and are supported beyond the front end of the car by means of strut pieces, secured to the sides of the car near its forward end. The upper and forward ends of the strut pieces carry the bearings for the propellor shaft, and are connected also by cords or wire to the upper end of a king post fixed to the car, and the upper end of king post to the suspension plate. A cord or wire passes from the front end of the car to the suspension plate. The top of the king post is connected also by wire or cord connections to the rear end of the car.

A rudder plane is hinged to the rear end of the car.

And in order that my invention and the manner in which the same is to be performed may be more readily and clearly understood, I have annexed hereto the accompanying sheet of drawings of an aerial machine constructed in accordance with this invention; of which

Figure 1 is a plan and

Figure 2 a side elevation.

a^1, a^2, a^3 and a^4 indicate the four vanes or wings of the upper fan; and b^1, b^2, b^3 and b^4 the four vanes or wings of the lower fan. As shewn, these wings are formed approximately triangular in shape, the base being curved to a relatively large radius; the forward edges, (indicated by the letter x), having a slight upward inclination from the centre to the outside of the fan; and the rear edges, marked y having a slight downward inclination. The framework of each wing is tee shaped in plan, consisting of a radial arm c and a curved flat strip d at right angles to the arm c. The arm c, as shewn, is formed of a piece tee shaped in section, the upper edge being curved, see Figure 2, so as to make the wing slightly concave on the underside. The under side of these arms c are covered by a second piece or strip of fabric joined at its edges to the main piece of fabric, so as to avoid friction or eddies round the underside of the arm c.

Additional flat strips d^1 are used to connect the ends of the strips d with the arm c at an intermediate point as shewn, to give additional strength, and also support to the fabric of the wing.

The ends of the cross pieces or strips d are connected by cords or wires e; those of the upper fan to a centre plate or hub f^1, and those of the lower fan to a centre plate or hub f^2. The inner ends of the radial arms c, are also attached to these centre plates or hubs respectively.

The upper fan is attached to vertical shaft g, which for the sake of lightness is preferably hollow or made of tubing, the inner ends of the arms c being attached to the flange or hub f^1 formed on a sleeve j. The lower portion of the shaft g passes down within a slightly larger tube h, which carries the lower fan.

The outer corners of the wings, and if desired, the ends of the arms c of the upper fan, are connected by wires or cords m to a stay ring m^1, secured to the vertical shaft g at some distance below the fan. These wires m take the main lifting strain produced by the air pressure on the underside of the fan vanes. To prevent the pull of the wires m or air pressure on the upper side of the fan causing any or an objectionable deflection of the frame, a second series of wires n pass to a plate o at the upper end of the tubular rod g. To enable the tension of the wires, and also of the wires m to be adjusted, the boss of the plate o is formed as a nut, and a screw p is provided, passing through the nut and bearing with its lower end against a block fixed inside and near the upper end of the tubular rod g; so that on rotating the screw p, the plate o is raised, tightening the wires n and m.

Similarly the outer corners of the wings and the outer ends of the arms c of the lower fan are connected by wires or cords s^1 to the stay ring o^1 fixed to the upper end of the tube h; and by wires or cords m^2 to the tube h below the lower fan for the same purpose.

The car q is carried from the loose ring or plate v by means of suspension wires q^1, q^2.

w^1 and w^2 are the propellors, and x^1 x^2 the propellor shafts, carried at the forward end of the car. The propellor ends of the shafts, which overhang the car considerably, are carried in bearings y^1 and y^2, supported by side struts z and tie rods 1 and 2, passing from the upper end of the post 3, which latter is fixed towards the front part of the car. The upper end of the post is also tied by wires 4 to the rear and sides of the car, and to the suspension plate v by the rod or wire q^1.

5 is a rudder plane, hinged to the rear end of the car.

The connections between the fans and propellors and the motor or motors are not essential or novel to this invention, and are therefore not illustrated.

Having now particularly described and ascertained the nature of my said invention and in what manner the same is to be performed, I declare that what I claim is:—

1. In aerial machines without aerostats and in which the machine is lifted by a pair of fans rotated in opposite directions, constructing each fan of four triangular vanes so that in plan the fans have the form of a "Maltese" cross, the gaps of which are only one fourth or thereabouts of the circumferential width of the vanes.

2. The construction of the vanes referred to in Claim 1, consisting in forming each frame of a radial piece tee shaped in section and curved on the upper side, a flat circumferential piece attached to the outer end of the radial arm and having its ends connected to the middle of the radial arm by flat pieces, and connected at its middle and at its two ends by cords having their lower ends attached to the shaft carrying it, at the maximum distance below the fan allowed by the fan or cage attachment below, these three points being also connected by cords above the fan to the shaft carrying the fan.

3. In an aerial machine lifted by fans according to Claims 1 and 2 the combination therewith of a flat bottomed car, diamond or boat shaped in plan, carrying beyond its forward end a pair of propellors or tractive fans, fitted respectively on the ends of a pair of horizontal shafts carried side by side at the upper part of the car, the bearings for the overhanging ends of the shaft being supported by upwardly inclined struts, having their lower ends secured to the sides of the car, the upper ends of the struts or the bearings being connected by wires or cords to the upper end of a vertical post carried on the forward half of the car, substantially as illustrated by and described with reference to Figure 2 of the accompanying drawings.

4. The general arrangement, combination and construction of parts forming my improvements in aerial machines substantially as illustrated by and described with reference to Figures 1 and 2 of the accompanying drawings.

Dated this 26th day of April, 1910.

J. CLARK JEFFERSON, F.I.P.A.,
30, Park Row, Leeds,
Agent for Applicant.

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